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(71) Applicant *(for all designated States except US)*: **UNILOY MILACRON INC.** [US/US]; 10501 Highway M-52, Manchester, MI 48158 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **SUNDERLAND, Thomas, L.** [US/US]; 6260 Burning Tree Lane, Jackson, MI 49201 (US).

(74) Agents: **SOSENKO, Eric, J.** et al.; Brinks Hofer Gilson & Lione, P.O. Box 10395, Chicago, IL 60610 (US).

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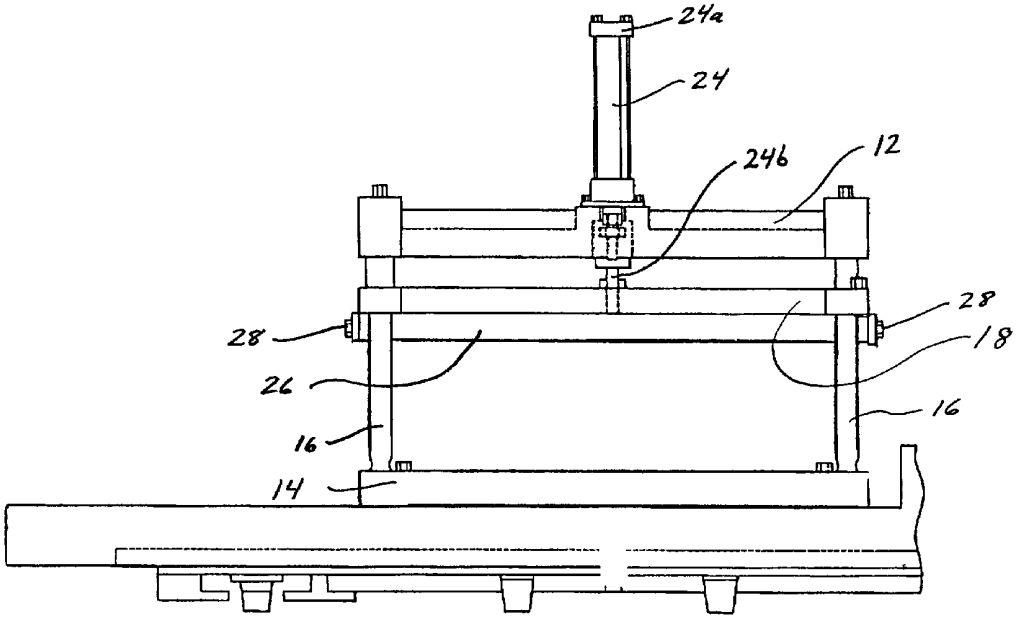
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: QUICK CHANGE EJECTION STATION TOOLING



(57) Abstract: An ejection station tooling assembly for a blow-molding machine including an upper support (12) and a lower spacer (14) mounted to the blow-molding machine and a plurality of slide rods (16) supported by and extending between the upper support and the lower spacer. A tooling plate (18) is mounted onto the slide rods for movement between a retracted position, toward the upper support, and an engaged position, toward the lower spacer. An adaptor plate is removably mounted to the bottom surface of the tooling plate and includes a plurality of ejection pins mounted thereon. The adaptor plate is removable from the tooling plate, allowing the ejection pins to be replaced, without removal of the tooling plate from the slide rods.

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QUICK CHANGE EJECTION STATION TOOLING

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention generally relates to a tooling assembly for the ejection station of a blow-molding machine, and more particularly to a tooling assembly having quick change capabilities.

BACKGROUND

[0002] Blow-molding machines typically include an ejection station where the finished product, such as a bottle, that is being manufactured on the blow-molding machine is ejected from the machine. On a dial type blow-molding machine, typically the ejection station will include a plurality of ejector pins that raise and lower within the ejection station. When the dial indexes a set of molded bottles to the ejection station, the ejector pins engage the mouth opening of the bottles to hold the bottles centered when the molds open. This is necessary to keep the bottles from sticking to one of the mold halves, and remaining within the mold half after the molds have opened. After the molds have opened, the ejector pins retract and the bottles fall from the ejector pins down to a chute that carries the finished bottles out of the machine.

[0003] Typically, the ejector pins are mounted on a plate that slide up and down within the ejection station as the dial indexed finished bottled to the ejection station. Currently, most blow-molding machines include a pair of slide rods onto which the plate with the ejection pins are mounted slides. In order to change the ejector pins within the ejection station, it is necessary to completely disassemble the upper portion of the ejection station to allow the plate to be slide up and off the top of the slide rods. This process is very difficult and time consuming due to the complexities of the machine and the size and weight of the components involved. Therefore, there is a

need in the industry for improved ejection station tooling which will allow the ejector pins to be removed and replaced more easily and quickly.

SUMMARY OF THE INVENTION

[0004] In accordance with an aspect of the present invention, an ejection station tooling assembly for a blow-molding machine includes an upper support and a lower spacer with a plurality of slide rods supported by and extending vertically between them. A tooling plate includes a top surface and a bottom surface and is mounted onto the slide rods for sliding movement between a retracted position, toward the upper support, and an engaged position, toward the lower spacer. An actuator is mounted onto the upper support and connected to the top surface of the tooling plate and is adapted to move the tooling plate between the retracted position and the engaged position. An adaptor plate is removably mounted to the bottom surface of the tooling plate and has a plurality of ejection pins mounted thereon. The adaptor plate is removable from the tooling plate to allow the ejection pins to be replaced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 is a perspective view of a tooling plate of the present invention;

[0006] FIG. 2 is a front view of the ejector station tooling of the present invention; and

[0007] FIG. 3 is a top view of the ejector station tooling of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0008] The following description of the preferred embodiment of the invention is not intended to limit the scope of the invention to this preferred embodiment, but rather to enable any person skilled in the art to make and use the invention.

[0009] An ejection station tooling assembly for a blow-molding machine is generally shown at 10. The ejection station tooling assembly 10 includes an upper

support 12 and a lower spacer 14 mounted thereon. A plurality of slide rods 16 are mounted between the upper support 12 and the lower spacer 14 and extend vertically therebetween. Preferably the slide rods 16 are made from a hard steel and include an polished smooth surface.

[0010] A tooling plate 18 is mounted to the slide rods 16. The tooling plate 18 includes a top surface 20 and a bottom surface 22 and is mounted onto the slide rods 16 such that the tooling plate 18 can slide between a retracted position and an engaged position. The retracted position is where the tooling plate 18 is held up near the upper support 12, and the engaged position is where the tooling plate 18 is lowered down near the lower spacer 14. An actuator is mounted onto the upper support 12 to control the movement of the tooling plate 18. In the preferred embodiment, the actuator is a hydraulic cylinder 24 that includes a body 24a mounted to the upper support 12 and a shaft 24b that is bolted or otherwise connected to the top surface 20 of the tooling plate 18. The hydraulic cylinder 24 raises and lowers the tooling plate 18 between the retracted position and the engaged position. It is to be understood, that any other suitable device could be incorporated to control the movement of the tooling plate 18 including but not limited to a pneumatic cylinder, or an electric servo motor or other such device.

[0011] An adaptor plate 26 is mounted to the bottom surface 22 of the tooling plate 18. The adaptor plate 26 includes a plurality of ejector pins (not shown) mounted thereon. The ejector pins are adapted to keep finished blow-molded parts centered as the molds retract. This is necessary to keep the finished parts from sticking to the neck mold halves as the neck mold halves open, thereby allowing the finished parts to drop down and out of the machine.

[0012] Typically, the adaptor plate 26 includes a pair of knife guides 28 mounted to opposing ends of the adaptor plate 26. The knife guides 28 include wedges (not

shown) that force the neck molds apart when the tooling plate 18 lowers to the engaged position.

[0013] Preferably, the tooling plate 18 includes a pair of alignment pins (not shown) extending down from the bottom surface 22 of the tooling plate 18 and the adaptor plate 26 includes a pair of corresponding apertures (not shown) adapted to receive the alignment pins to locate the adaptor plate 26 on the tooling plate 18. The alignment pins allow the adaptor plate 26 to be quickly mounted to the bottom surface 22 of the tooling plate 18 and insures that the adaptor plate 26 is positioned correctly on the tooling plate 18.

[0014] In the preferred embodiment, the ejection station tooling assembly 10 includes a pair of front slide rods 16a and a pair of rear slide rods 16b. The front slide rods 16a are spaced from each other along a first center line 34 toward the front of the ejection station. The rear slide rods 16b are spaced from each other along a second center line 36 toward the rear of the ejection station. The first center line 34 and the second center line 36 are parallel to each other, such that the front pair and rear pair of slide rods 16a, 16b form a rectangular pattern when viewed from the top of the machine.

[0015] The tooling plate 18 includes four apertures 38 extending therethrough to receive the slide rods 16. Preferably, each of the apertures 38 includes a bushing (not shown) fitted to the diameter of the slide rods 16 to allow the tooling plate 18 to easily slide along the slide rods 16.

[0016] The adaptor plate 26 has a width 40 that is less than the distance between the front slide rods 16a and the rear slide rods 16b. This is necessary to allow the adaptor plate 26 to fit between the front slide rods 16a and the rear slide rods 16b for removal and replacement.

[0017] Traditional blow-molding machines include only a pair of slide rods wherein the ejector pins are mounted to the a plate having a pair of apertures to receive the two slide rods. In these traditional machines, the upper tooling must be disassembled to allow the plate to be slid off the top of the slide rods so the tooling on the plate can be changed.

[0018] The present invention also lends itself to retro-fitting of existing blow-molding machines, thereby making the changing of tooling in those machines more easily performed.

[0019] In a retro-fitted machine, incorporating the ejection station tooling assembly 10 of the present invention, the front slide rods 16a are spaced from each other the same distance as the pair of slide rods (now removed) originally in the traditionally constructed machine. Likewise, the rear slide rods 16b are spaced apart that same distance. Accordingly, the length of the existing plate of that machine is longer than the distance between the slide rods of either the front or rear slide rod pairs 16a, 16b. While it is a goal of the present invention to allow the ejector pins to be replaced without requiring the upper tooling of the blow-molding machine to be disassembled, it is also a goal of the present invention to enable the use of existing plates from prior blow-molding machines with the traditional two slide bar arrangement.

[0020] To achieve the later objective, the distance between the front and rear slide bars 16a, 16b is wide enough to accommodate the width of existing plates, thereby allowing the plates to be used as adaptor plates 26 and to be inserted and positioned between the front and rear slide rods 16a, 16b for installation and removal. This allows the ejector pins, which are mounted to the adaptor plate 26 to be removed from the machine without having to remove the upper tooling of the ejection station assembly 10.

[0021] The foregoing discussion discloses and describes one preferred embodiment of the invention. One skilled in the art will readily recognize from such discussion, and from the accompanying drawings and claims, that changes and modifications can be made to the invention without departing from the true spirit and fair scope of the invention as defined in the following claims. The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

CLAIMS

1. An ejection station tooling assembly for a blow-molding machine comprising:

an upper support and a lower spacer;

a plurality of slide rods supported by and extending vertically between said upper support and said lower spacer;

a tooling plate including a top surface and a bottom surface and mounted onto said slide rods for sliding movement between a retracted position, toward said upper support, and an engaged position, toward said lower spacer;

an actuator mounted onto said upper support and connected to said top surface of said tooling plate, said actuator adapted to move said tooling plate between said retracted position and said engaged position;

an adaptor plate removeably mounted to said bottom surface of said tooling plate, said adaptor plate having a plurality of ejection pins mounted thereon and being removable from said tooling plate to allow said ejection pins to be replaced.

2. The ejection station tooling assembly of claim 1, wherein said plurality of slide rods includes a pair of front slide rods and a pair of rear slide rods, said front slide rods being spaced from each other along a first center line and said rear slide rods being spaced from each other along a second center line parallel to said first center line; said front slide rods being spaced from said rear slide rods, and said tooling plate including four apertures with one of said slide rods extending through each thereof.

3. The ejection station tooling assembly of claim 2 wherein said adaptor plate has a width that is less than the distance between said front slide rods and said rear slide rods, thereby allowing said adaptor plate to be inserted between said front slide rods and said rear slide rods when being mounted to and removed from said tooling plate.

4. The ejection station tooling assembly of claim 1 wherein said tooling plate includes a pair of alignment pins and said adaptor plate includes a pair of corresponding apertures adapted to receive said alignment pins to locate said adaptor plate on said tooling plate.

5. The ejection station tooling assembly of claim 4 wherein said adaptor plate further includes opposing first and second ends, each of said first and second ends including a knife guide mounted thereon.

6. The ejection station tooling assembly of claim 1 wherein said device for moving said tooling plate between the retracted position and the engaged position is a hydraulic cylinder.

7. An ejection station tooling assembly for a blow-molding machine comprising:

an upper support and a lower spacer;

a pair of front slide rods and a pair of rear slide rods supported by and extending vertically between said upper support and said lower spacer, said front slide rods being spaced from each other along a first center line and said rear slide rods being spaced from each other along a second center line parallel to said first center line; said front slide rods being spaced from said rear slide rods, and said tooling plate including four apertures with one of said slide rods extending through each thereof.

a tooling plate including a top surface and a bottom surface and mounted onto said slide rods for sliding movement between a retracted position, toward said upper support, and an engaged position, toward said lower spacer;

an actuator mounted onto said upper support and connected to said top surface of said tooling plate, said actuator adapted to move said tooling plate between said retracted position and said engaged position;

an adaptor plate removeably mounted to said bottom surface of said tooling plate, said adaptor plate having a plurality of ejection pins mounted thereon and being removable from said tooling plate to allow said ejection pins to be replaced.

8. The ejection station tooling assembly of claim 7 wherein said adaptor plate has a width that is less than the distance between said front slide rods and said rear slide rods, thereby allowing said adaptor plate to be inserted between said front slide rods and said rear slide rods when being mounted to and removed from said tooling plate.

9. The ejection station tooling assembly of claim 7 wherein said tooling plate includes a pair of alignment pins and said adaptor plate includes a pair of corresponding apertures adapted to receive said alignment pins to locate said adaptor plate on said tooling plate.

10. The ejection station tooling assembly of claim 9 wherein said adaptor plate further includes opposing first and second ends, each of said first and second ends including a knife guide mounted thereon.

11. The ejection station tooling assembly of claim 7 wherein said device for moving said tooling plate between the retracted position and the engaged position is a hydraulic cylinder.

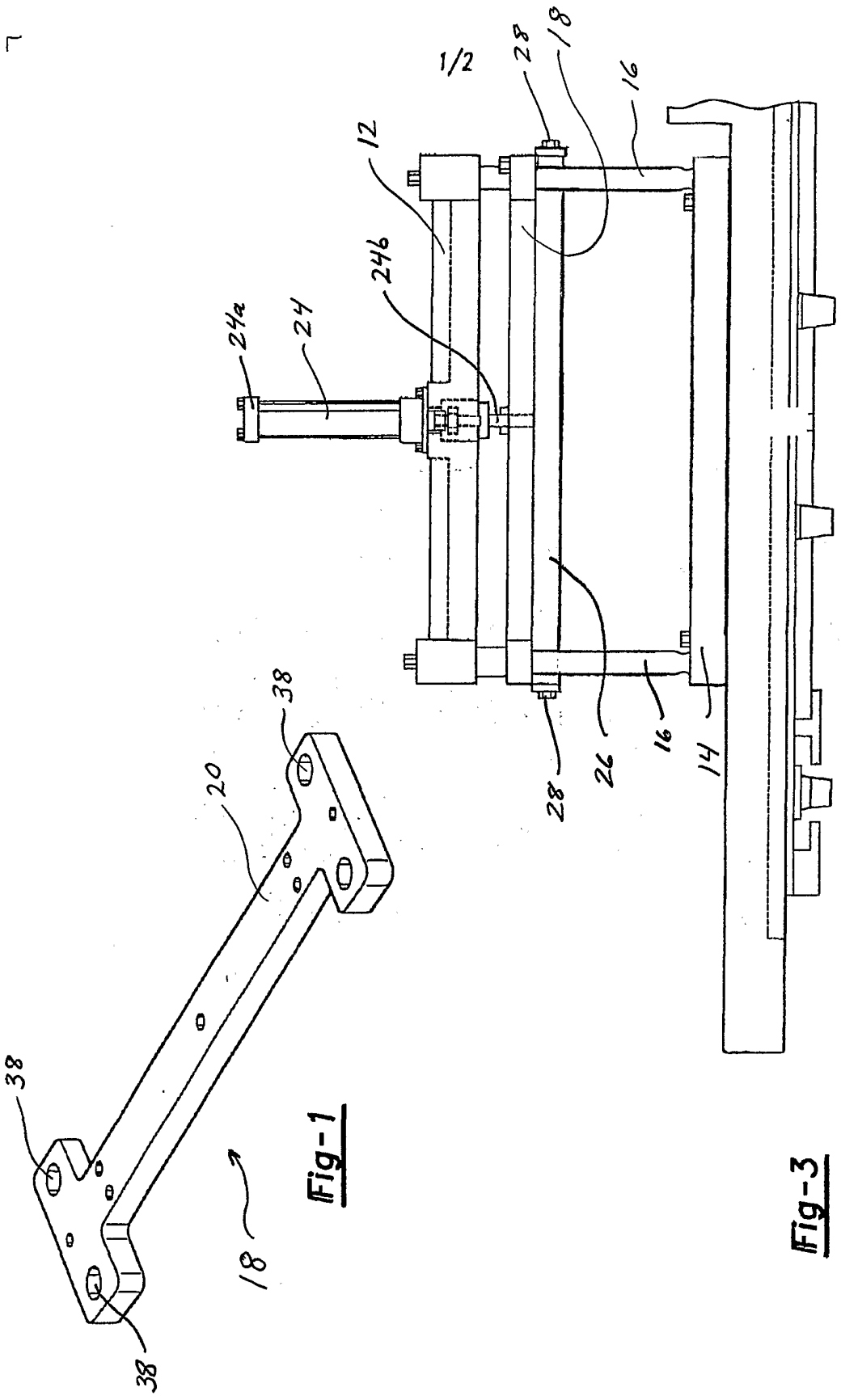

Fig-1

Fig-3

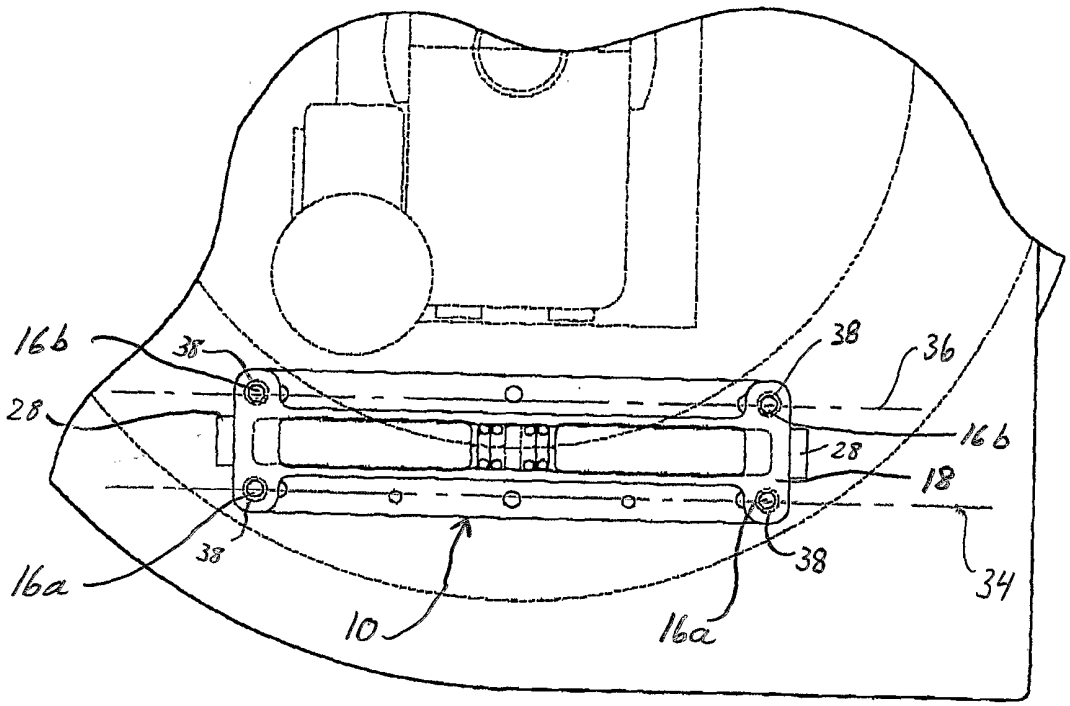

Fig-2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/16997

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : B29C 49/70

US CL : 425/182, 537

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 425/182, 537

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,441,878 A (HARRY) 10 April 1984 (10.04.1984), see figures 1-3).	1, 7
A	US 5,308,237 A (KIERAN) 03 May 1994 (03.05.1994), see figures 5-12.	1, 7
A	US 5,589,130 A (TAKADA et al) 31 December 1996, see figures 6 and 8.	1, 7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

Robert B. Davis

Telephone No. 703-308-0661

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